

We claim:

1. An algorithm to aid in the selection of a treatment plan for vision correction in a patient's eye, comprising:
  - obtaining selected diagnostic input data types about the patient's eye;
  - parameterizing the input data to classify the patient's eye into one of a predetermined plurality of classification sets;
  - determining a viable plurality of treatment algorithms for potentially correcting the patient's vision based upon the classification;
  - presenting a respective plurality of treatment plans based upon the treatment algorithms for prospective selection of one of the treatment plans.
2. The algorithm of claim 1, further comprising selectively modifying a default parameter of at least one of the treatment algorithms and presenting a modified treatment plan for prospective selection of one of the treatment plans.
3. The algorithm of claim 1, wherein the input data types comprise one or more of wavefront data, topography data, pachymetry data, and refraction data.
4. The algorithm of claim 3, wherein the classifying step comprises determining whether the eye is one of a) a virgin eye or a previously treated eye, b) a regular eye or an irregular eye, and c) a myopic eye with or without mixed astigmatism or a hyperopic eye with or without mixed astigmatism.
5. The algorithm of claim 1, wherein the input data types include diagnostic wavefront data and diagnostic corneal data, the data of each of which is stored in a different, user selectable file.

6. A method for aiding the selection of a treatment plan for correcting vision in a patient's eye, comprising:

obtaining selected input diagnostic data about the patient's eye;

analyzing the data to determine a plurality of potentially useable treatment algorithms from an equal or larger number of available treatment algorithms, and processing said plurality of potentially useable treatment algorithms, wherein said available treatment algorithms utilize one or more default parameters;

presenting for review a plurality of treatment plans corresponding to said plurality of potentially useable treatment algorithms;

selectively modifying the one or more default parameters and other treatment parameters;

re-processing said plurality of potentially useable treatment algorithms using the modified parameters; and

re-presenting for further review the plurality of treatment plans corresponding to said plurality of potentially useable treatment algorithms.

7. The method of claim 6, further comprising selecting one of the treatment plans.

8. The method of claim 7, further comprising engaging a therapeutic laser ablation component of a vision correction system that is adapted to apply the selected treatment plan to the patient's eye.

9. The method of claim 6, wherein said treatment plans comprise data relating to at least some of a laser ablation spot size, a laser ablation shot placement, a laser ablation shot sequence, a laser shot file, a simulated post-operative wavefront map,

a simulated post-operative topography map, a simulated ablation profile, an axial keratometric map, corneal pachymetry, optical zone dimension, a manifest refraction value, a target refraction value, higher-order aberration information, a residual stromal tissue depth, and a vision metric.

10. The method of claim 9, further comprising selectively sorting at least some of the data for each of the treatment plans according to a user preferred criteria including at least one of the target refraction, the residual stromal depth, and the optical zone dimension.

11. The method of claim 10, further comprising optimizing at least one of the user preferred criteria.

12. The method of claim 10, further comprising selectively presenting the sorted data for review by the user.

13. The method of claim 6, wherein the step of providing input diagnostic data comprises providing at least one of wavefront data only, topography data only, wavefront and topography data with or without corneal pachymetry data, and one of the preceding data plus other selected data.

14. The method of claim 6, wherein said available treatment algorithms comprise at least two algorithms selected from a group including a myopia treatment only, a hyperopia treatment only, a myopia treatment with astigmatism, a hyperopia treatment with astigmatism, a lower-order aberration correction treatment, a higher-order aberration correction treatment, a higher-order corneal aberration treatment, a re-treatment, a spherical corrective treatment, an aspherical corrective treatment, a LASIK

treatment, a LASEK treatment, a PRK treatment, a nomogram adjusted treatment, and a customized treatment.

15. The method of claim 6, wherein said one or more default parameters represent a value for parameters including at least one of an optical zone, a corneal flap thickness, and another parameter that influences the calculation of the algorithms.

16. The method of claim 6, further comprising providing a display device displaying a graphical user interface (GUI) for use by a user.

17. The method of claim 6, further comprising saving the plurality of re-processed treatment plans on a device readable medium.

18. The method of claim 6, wherein the sorting step comprises optimizing at least one of the user preferred criteria and sorting based upon said optimization.

19. The method of claim 16, wherein displaying said GUI further comprises selectively displaying a data check screen that contains summary data of the selected treatment plan.

20. The method of claim 19, wherein the summary data includes one or more of patient identifying information, selected treatment plan, manifest refraction, objective refraction for a given pupil diameter, pre- and targeted post-operative K values, pre- and targeted post-operative Q values, optical zone size, treatment zone, number of ablation shots and treatment time, maximum ablation depth, central ablation depth, and residual stromal pachymetry for a specified corneal flap thickness.

21. The method of claim 6, wherein the processing step further comprises utilizing at least one of rotational eye-tracking data and microkeratometric data.

22. The method of claim 6, further comprising automatically recommending to the user a preferred treatment plan.

23. The method of claim 6, wherein the analyzing step comprises identifying an allowable limit parameter for each of the available treatment algorithms and determining the potentially useable treatment algorithms based upon whether the allowable limit parameters are exceeded.

24. The method of claim 16, wherein the use of the GUI comprises user options selected from a group comprising patient selection, default value adjustment, displaying processing software information, inputting patient data, and creating display screen headers.

25. The method of claim 16, wherein the display of the GUI includes color coding of the treatment plans, selective display of rotational eye-tracking information, selective display of microkeratometric information, minimization/maximization of data presentation size, a warning message based on a user selected parameter modification, saving of treatment plan parameters to a selected storage medium, and other parametric monitoring.

26. The method of claim 6, wherein the plurality of treatment plans include a customized treatment plan that reduces higher order wavefront aberrations and a non-customized treatment plan that improves lower order aberrations.

27. The method of claim 26, wherein the non-customized treatment plan is based, at least in part, on a non-normalized K-reading value of the patient's eye.

28. The method of claim 26, wherein the non-customized treatment plan is based, at least in part, on an aspheric corneal shape factor,  $Q$ , of the patient's eye.

29. The method of claim 26, wherein each of the treatment plans is based, at least in part, on a prospective residual stroma thickness value.

30. The method of claim 29, wherein the prospective residual stroma thickness value is an estimated value.

31. The method of claim 29, wherein the prospective residual stroma thickness value is a calculated value.

32. A system used for planning a treatment for vision correction in a patient's eye, comprising:

means for receiving a diagnostic input data about the patient's vision, for analyzing the input data and determining a plurality of potentially useable treatment algorithms from an equal or larger number of available treatment algorithms, and for processing said potentially useable treatment algorithms based upon the input data and one or more pre-selected algorithm default parameters;

means for displaying a plurality of treatment plans corresponding, respectively, to the plurality of potentially useable treatment algorithms, for selectively modifying the algorithm default parameters and other defined treatment influencing parameters, and for displaying a respective plurality of modified treatment plans, operatively connected to said receiving means.

33. The system of claim 32, wherein the display means is further adapted for selecting a preferred treatment plan.

34. The system of claim 33, further comprising a device readable storage medium that can selectively store the plurality of modified treatment plans including the selected preferred treatment plan.

35. The system of claim 34, further comprising a therapeutic laser ablation component in operative communication with said storage medium and adapted to apply the selected preferred treatment plan to the patient's eye.

36. The system of claim 33, wherein each one of the plurality of modified treatment plans includes a respective instruction describing a laser ablation shot file.

37. The system of claim 36, wherein the laser ablation shot files comprise at least a placement and sequence determination of laser ablation shots on the patient's eye.

38. The system of claim 32, wherein the diagnostic input data is selected from a group including at least one of wavefront data only, topography data only, wavefront and topography data with or without corneal pachymetry data, and one of the preceding data plus other selected algorithm influencing data.

39. The system of claim 32, wherein the larger number of available treatment algorithms is selected from a group of at least two relating to a myopia treatment only, a hyperopia treatment only, a myopia treatment with astigmatism, a hyperopia treatment with astigmatism, a lower-order aberration correction treatment, a higher-order aberration correction treatment, a re-treatment, a spherical corrective treatment, an aspherical corrective treatment, a LASIK treatment, a LASEK treatment, a PRK treatment, a nomogram adjusted treatment, and a customized treatment.

40. The system of claim 32, wherein the receiving means comprises a software-driven calculation module.

41. The system of claim 32, wherein the display means comprises a display device displaying a multi-level GUI.

42. The system of claim 34, wherein the device readable storage medium comprises one of a floppy disk, a CD, a DVD, a computer hard drive, and electromagnetic data storage means.

43. The system of claim 35, wherein the therapeutic laser ablation component comprises a laser system adapted for photoablation of corneal tissue operatively connected to an eye tracker component.

44. The system of claim 32, wherein the receiving and display means, respectively, are further adapted for sorting and displaying a plurality of user defined criteria for each of the calculated treatment plans.

45. The system of claim 41, wherein the multi-level GUI includes a data check display showing summary data of the selected treatment plan.

46. The system of claim 41, wherein the multi-level GUI includes a start-up navigation screen.

47. The system of claim 46, further including a screen for viewing user modifiable preference and default settings.

48. The system of claim 46, further including a screen for viewing a diagnostic data file.

50. The system of claim 46, further including a screen for viewing patient information.

51. The system of claim 46, further including a screen for viewing a treatment plan calculation.

52. The system of claim 51, further including a screen for simultaneously viewing at least two treatment plan calculations.



53. The system of claim 46, further including a data check screen.